



ROM Monitor Overview

This chapter provides an overview of ROM Monitor concepts and operations. For instructions on how to perform various tasks in ROM Monitor (ROMMON) mode, see the other chapters in this book.

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Information About ROM Monitor

The ROM Monitor is a bootstrap program that initializes the XR 12000 hardware and boots the Cisco IOS XR software when you power on or reload a router. A version of the ROM Monitor software exists on each card and is factory supplied. The ROM Monitor program provides an initial power-on environment for each card. If the Cisco IOS XR software is rebooted or unable to run, the corresponding card returns to the ROM Monitor mode.

When you connect a terminal to a card that is in the ROM Monitor mode, the ROM Monitor CLI prompt is displayed.

Cisco XR 12000 Series Router Prompt

```
rommon1>
```

The ROM Monitor software is known by many names. It is sometimes called ROMMON because of the CLI prompt in ROM Monitor mode. The ROM Monitor software is also called the boot software, boot image, or boot helper. On the Cisco XR 12000 Series Routers, the Boothelper software is different from the ROM Monitor software, except for the Performance Route Processor-3 (PRP-3) cards. For PRP-3 cards, the boot helper is integrated with the ROM Monitor software.

Although it is distributed with routers that use the Cisco IOS XR software, ROM Monitor is a separate program from the Cisco IOS XR software. During normal startup, the ROM Monitor initializes the cards, and then control passes to the Cisco IOS XR software. After the Cisco IOS XR software takes over, ROM Monitor is no longer in use.

A copy of the ROM Monitor software exists on each card. If a card fails to boot the Cisco IOS XR software, the card is forced to run from the ROM Monitor mode. Because a card in ROM Monitor mode is not running the Cisco IOS XR software, that card becomes unavailable for normal router operations.

Understanding the Role of the DSC

The active Route Processor (RP) for the owner Secure Domain Router (SDR) is called the Designated Shelf Controller (DSC). This card performs system-wide functions, including the creation of additional non-owner SDRs. If the active DSC is placed in ROM Monitor mode, it is no longer running the Cisco IOS XR software. If a standby DSC is available, the standby RP resumes router operations. If a standby DSC is not available or is also placed in the ROM Monitor mode, then router operations stop.

Designated Secure Domain Router Shelf Controller (DSDRSC)

In addition to the DSC, each SDR in the system contains at least one DSDRSC. The DSDRSCs provide configuration and administrative functions for a single SDR only. The DSC also serves as the DSDRSC for the owner SDR.

When the Designated Secure Domain Router Shelf Controller (DSDRSC) in an SDR is placed in ROM Monitor mode, the router operations are transferred to the standby DSDRSC (if available). If both the primary and standby DSDRSCs are in ROM Monitor mode, then the router operations cease because the Cisco IOS XR software is no longer running.

Accessing ROM Monitor Mode on the DSC

In most situations, you interact with the ROM Monitor mode only on the DSC (DSDRSC for the owner SDR). The DSC contains the administration configuration for the entire system and distributes the required software to all the other nodes in the router. All the tasks in this document describe ROM Monitor mode accessed through the DSC for the system.



Note

The only time you will interact with a non-DSC node is when reinstalling the Cisco IOS XR software on the standby PRP of a Cisco XR 12000 Series Router.

Remember, the DSC is also the DSDRSC for the owner SDR.

Environmental Variables and the Configuration Register

Two primary connections exist between ROM Monitor and the Cisco IOS XR software: the ROM Monitor environment variables and the configuration register.

The ROM Monitor environment variables define the location of the Cisco IOS XR software and describe how to load it. After ROM Monitor has initialized the card, it uses the environment variables to locate and load the Cisco IOS XR software. The common environment variables are BOOT, IP_ADDRESS, DEFAULT_GATEWAY, TFTP_FILE, TURBOBOOT and SUBNET_MASK.

The configuration register is a software setting that controls how a card starts up. One of the primary uses of the configuration register is to control whether the card starts in ROM Monitor mode or Administration EXEC mode. The configuration register is set in either ROM Monitor mode or Administration EXEC mode as needed. Typically, you set the configuration register using the Cisco IOS XR software prompt on the active RP when

you need to use ROM Monitor mode. When the maintenance in ROM Monitor mode is complete, you change the configuration register so the card reboots with the Cisco IOS XR software.

**Note**

Throughout this guide, the term PRP is used to refer to the PRP cards supported on Cisco XR 12000 Series Routers. Cisco XR 12000 Series Router supports both the PRP-2 and the PRP-3 cards. If a feature or an issue applies to only one platform, the accompanying text specifies the platform.

Accessing ROM Monitor Mode with a Terminal Connection

When an RP is in ROM Monitor mode, you can access the ROM Monitor software only from a terminal connected directly to the console port of the card. Because the Cisco IOS XR software (EXEC mode) is not operating, the nonmanagement interfaces (such as POS interfaces) are not accessible. Basically, all Cisco IOS XR software resources are unavailable. The hardware is there, but no configuration exists to make use of the hardware.

Network Management Access and ROM Monitor Mode

Some people get confused when they start to use ROM Monitor mode. It is important to remember that ROM Monitor mode is a router mode, not a mode within the Cisco IOS XR software. It is best to remember that ROM Monitor software and the Cisco IOS XR software are two separate programs that run on the same router. At any given time, the router is running one of these programs, but it never runs both at the same time.

One area that can be confusing when using ROM Monitor and the Cisco IOS XR software is the area that defines the IP configuration for the Management Ethernet interface. Most router users get comfortable with configuring the Management Ethernet interface in the Cisco IOS XR software. When the router is in ROM Monitor mode, however, the router is not running the Cisco IOS XR software, so that Management Ethernet interface configuration is not available.

To access other devices, such as a TFTP server, while in ROM Monitor mode on the Cisco XR 12000 Series Router, you must configure the ROM Monitor variables with IP access information.

Entering ROM Monitor Mode

The following sections describe two ways to enter ROM Monitor mode:

Prerequisites

Before you place a DSC in ROM Monitor mode, verify that the system is in a steady state:

- 1 Prepare the DSC:

- Anticipate substantial downtime, including the loss of packet forwarding on the system.
- Verify the sanity of the configuration file system using the **cfs check** command in EXEC mode.
- Verify that all changes to the active router configuration are saved with the **commit** command in any configuration mode.
- Verify that all changes to the active software set are saved with the **install commit** command in Administration EXEC mode.

- Verify that all install commit processes are complete with the **show install committed** command in Administration EXEC mode. This command displays the committed packages that become active during the next router boot. If any of the processes are not committed, use the **install commit** command in the Administration mode.
- 2 Verify that the other nodes in the system are in a steady state:
 - If a standby RP is installed, verify that it is in the ready state with the **show redundancy** command in EXEC mode.
 - Verify that all available nodes in the system are in IOS XR RUN state with the **show platform** command in EXEC mode.

After you have verified that the system is in a stable state, you can enter ROM Monitor mode by setting the configuration register setting and entering the **reload** command, as described in the following steps:

Resetting the Configuration Register and Reloading a DSC to ROM Monitor Mode

In normal operating conditions, it should not be necessary to use ROM Monitor mode. If you do find it necessary to place a designated shelf controller (DSC) in ROM Monitor mode, make sure that the system is in a steady state and that you are prepared for the consequences of a system reload.

SUMMARY STEPS

1. Verify the router is in a steady state.
2. Connect a terminal to the DSC console port and log in to the router.
3. **admin**
4. **config-register 0x0** command, **exit** command and **reload** command or **config-register 0x0 location all** command and **reload location all** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	Verify the router is in a steady state.	Ensures that all configurations are saved and that no installation processes are running.
Step 2	Connect a terminal to the DSC console port and log in to the router.	Connects a terminal or PC to the DSC console port and establishes a router management session. For more information on connecting a terminal, see <i>Connecting and Communicating with the Router</i> in Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router.
Step 3	admin Example: RP/0/0/CPU0:router# admin	Enters administration EXEC mode.

	Command or Action	Purpose
Step 4	<p>config-register 0x0 command, exit command and reload command or config-register 0x0 location all command and reload location all command.</p> <p>Example: RP/0/0/CPU0:router (admin)# config-register 0x0 RP/0/0/CPU0:router (admin)# exit RP/0/0/CPU0:router# reload Or, RP/0/0/CPU0:router (admin)# config-register 0x0 location all RP/0/0/CPU0:router (admin)# reload location all</p>	<ul style="list-style-type: none"> • Enter the following commands to place only the DSC in ROM Monitor mode: • Enter the config-register 0x0 command to set the configuration register for ROM Monitor mode during the next card reload. • Enter the exit command to exit administration EXEC mode. • Enter the reload command to reload the DSC and enter ROM Monitor mode. <p>Note • If there is a standby DSC, the configuration register on the standby DSC is also set to 0x0. When you place the active RP in ROM Monitor mode, the system fails over to the standby RP, which then becomes the active RP. If both RPs need to be in ROM Monitor mode, connect to the new active RP and enter the reload command.</p> <ul style="list-style-type: none"> • Enter the following commands to place all RPs and SCs in ROM Monitor mode: • Enter the config-register 0x0 location all command to reset the configuration register for all RPs in the system. • Enter the reload location all command in administration EXEC mode to reload all RPs in the system. <p>Note Make sure you have access to the console ports of both RPs on the system. To enter the system to the ROM Monitor mode, press Ctrl-C a few times on both RP consoles until you get to the ROM Monitor mode.</p> <p>Caution Resetting the configuration register may change the baud rate for the console. The default baud rate is 9600.</p> <p>Tip To verify the configuration register setting, enter the show variables boot command in the administration EXEC mode.</p>

Verifying the Router State: Example

The following example shows the redundancy roles of both RPs and shows that both are operating in IOS XR RUN state:

```
RP/0/0/CPU0:router#show redundancy
Sun Jun  6 13:12:19.880 DST
Redundancy information for node 0/0/CPU0:
=====
Node 0/0/CPU0 is in ACTIVE role
Node 0/0/CPU0 has no valid partner

Reload and boot info
-----
```

```
PRP reloaded Sat Jun 5 00:09:00 2010: 1 day, 13 hours, 3 minutes ago
Active node booted Sat Jun 5 00:09:00 2010: 1 day, 13 hours, 3 minutes ago
```

```
read_last_reboot_record: reboot history looks corrupted (index = 4096)
Unable to read last reboot record, err 89(Function not implemented)
Active node reload : Unable to retrieve reboot reason
```

```
RP/0/0/CPU0:router#show platform
```

```
Sun Jun 6 13:15:59.580 DST
Node          Type          PLIM          State          Config State
-----
0/0/CPU0      PRP(Active)   N/A           IOS XR RUN     PWR, NSHUT, MON
0/1/CPU0      L3 Service Eng N/A           Admin Down     PWR, SHUT, MON
0/2/CPU0      L3LC Eng 3    OC3-ATM-4     IOS XR RUN     PWR, NSHUT, MON
0/3/CPU0      L3LC Eng 5+   Jacket Card   IOS XR RUN     PWR, NSHUT, MON
0/3/1         SPA           SPA-IPSEC-2G-2  READY         PWR, NSHUT
0/3/2         SPA           SPA-1XCHSTM1/OC  READY         PWR, NSHUT
0/4/CPU0      L3LC Eng 5    Jacket Card   IOS XR RUN     PWR, NSHUT, MON
0/4/0         SPA           SPA-5X1GE      READY         PWR, NSHUT
```

Placing the DSC in ROM Monitor Mode: Example

The following example shows how to place the RP0 in the ROM Monitor mode:

```
RP/0/0/CPU0:router# admin
RP/0/0/CPU0:router(admin)#
  config-register 0x0

RP/0/0/CPU0:router(admin)# reload

Proceed with reload? [confirm]
System Bootstrap, Version 12.0(20040624:164256) [assafb-misc1 1.14dev(0.91)] DEV
ELOPMENT SOFTWARE
Copyright (c) 1994-2004 by cisco Systems, Inc.

DRAM DIMM Slot 1: 512M found, Slot 2: Empty
MPC7450 platform with 524288 Kbytes of main memory

rommon 1 >
Configuring MPPs ...
Configuring PCMCIA slots ...

System Bootstrap, Version 2.06 ,
Copyright (c) 1994-2009 by Cisco Systems, Inc.

Acquiring backplane mastership .... successful
Preparing for fan initialization..... ready
Setting fan speed to 4000 RPMs successful
Reading backplane EEPROM ...
Released backplane mastership ...

Board type is 0x100002 (1048578)

Switch 0 initialized
Backplane FE port Up... Enabling
Enabling watchdog
G4(7457-NonSMP-MV64360 Rev 3) platform with 4096 MB of main memory

rommon B1 >
```

Manually Halting the Initialization Process During System Reload

To force the DSC to stop loading and enter ROM Monitor mode, press Ctrl-] when you see the following message:

```
MBI validation sending request.
HIT Ctrl-]
TYPE 'Send Break'to abort
```

This message usually appears during the first 20 seconds of system startup. Press the Ctrl-] key combination immediately. This ends your Telnet session to the console or auxiliary port. Enter **send break** and press the **Return** key repeatedly to ensure that the initialization process stops and the system enters the ROM Monitor mode.

This operation can be performed only from a terminal directly connected to the DSC console port. For more information, see the “Connecting and Communicating with the Router” section in Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router.



Note

When the DSC is placed in ROMMON, it switches over to the standby DSC, which can then also be placed in ROMMON. Repeat this process for both RP cards.

ROM Monitor Commands

The commands in the ROM Monitor mode are different from those available in the Cisco IOS XR software. You can run ROM Monitor commands only while in ROM Monitor mode, and you cannot run Cisco IOS XR software commands. This section includes the following topics:

Commonly Used ROM Monitor Commands

The table below summarizes the commands commonly used in ROM Monitor. For specific instructions on using these commands, refer to the relevant procedure in this document.

Table 1: Commonly Used ROM Monitor Commands

ROMMON Command	Description
boot dsc	Sets up the communication with active RP and downloads MBI to launch Cisco IOS XR software on RP. Note This command is not applicable for PRP-3 card, as PRP-3 does not support single image.
boot image	Manually boots a vm Cisco IOS XR software image.

ROMMON Command	Description
<code>boot image -o config-file-path</code>	Manually boots the Cisco IOS XR software with a temporary alternative administration configuration file.
<code>boot image -a config-file-path</code>	Manually boots the Cisco IOS XR software with an alternative SDR configuration file.
<code>cookie</code>	Displays the system cookie.
<code>confreg</code>	Changes the config-register setting. Note When the value of confreg is 0, it means autoboot is disabled and you need to manually boot the Cisco IOS XR software image from the ROM Monitor mode. However, if the value of confreg is non-zero value of 0x2, it means autoboot is enabled and the ROM Monitor mode automatically boots the Cisco IOS XR software image given in the BOOT= environment variable.
<code>dev</code>	Displays the available local storage devices (for example, disk0: and disk1:).
<code>dir</code>	Displays the files on a storage device.
<code>reset</code>	Resets the node.
<code>set</code>	Displays the currently set ROM Monitor environmental settings.
<code>sync</code>	Saves the new ROM Monitor environmental settings.
<code>unset</code>	Removes an environmental variable setting.

Displaying the Available ROM Monitor Commands

The table below describes the available **help** commands for ROM Monitor mode.

Table 2: Help Commands in ROMMON

	Description
help or ?	Displays a summary of all available ROM Monitor commands.
-?	Displays information about command syntax.

**Note**

Commands are case sensitive. You can halt any command by pressing **Ctrl-C**.

Displaying the Available ROM Monitor Commands: Examples

The following example shows what appears when you enter the **?** command on a Cisco XR 12000 Series Router:

```
rommon 2 > ?
alias          set and display aliases command
boot          boot up an external process
break        set/show/clear the breakpoint
confreg      configuration register utility
cont         continue executing a downloaded image
context      display the context of a loaded image
dev          list the device table
dir          list files in file system
dis         disassemble instruction stream
dnld        serial download a program module
frame       print out a selected stack frame
help        monitor builtin command help
history     monitor command history
meminfo     main memory information
repeat      repeat a monitor command
reset       system reset
set         display the monitor variables
stack      produce a stack trace
sync       write monitor environment to NVRAM
sysret     print out info from last system return
unalias    unset an alias
unset      unset a monitor variable
```

The following example shows the parameters for the **dir** (directory) command:

```
rommon 2 > dir -?
bad device name
usage: dir <device>
```

Changing the ROM Monitor Prompt

You can change the prompt in ROM Monitor mode by using the **PS1=** command as shown in the following example:

```
rommon 2 > PS1= "GSR_ROMMON_2!>"
```

Changing the prompt is useful if you are working with multiple routers in ROM Monitor at the same time. This example specifies that the prompt is **GSR_ROMMON_2** followed by the line number.

Displaying the Configuration Register Setting

To display the current configuration register setting, enter the **confreg** command without parameters as follows:

```
rommon 2 > confreg
```

```
Configuration Summary
(Virtual Configuration Register: 0x0)
enabled are:
console baud: 9600
boot: the ROM Monitor
```

```
do you wish to change the configuration? y/n [n]:
```

The configuration register setting is labeled Virtual Configuration Register. Enter the **no** command to avoid changing the configuration register setting.

Environment Variables

The ROM Monitor environment variables define the attributes of the ROM Monitor, such as the IP address for an RP control Ethernet port or the location of the Cisco IOS XR software and describe how to load it. Environmental variables are entered like commands and are always followed by the equal sign (=). Environment variable settings are entered in capital letters, followed by a definition. For example:

```
TURBOBOOT=on,disk0,format
```

Under normal operating conditions, you do not need to modify these variables. They are cleared or set only when you need to make changes to the way ROM Monitor operates.

Frequently Used Environmental Variables

The table below shows the main ROM Monitor environmental variables. For instructions on how to use these variables, see the relevant instructions in this document.

Environmental variable	Description
IP_ADDRESS = <i>ip_address</i>	Sets the IP address for the Management Ethernet interface on the DSC.
IP_SUBNET_MASK = <i>ip_address</i>	Sets the subnet mask for the Management Ethernet interface on the DSC.
DEFAULT_GATEWAY = <i>ip_address</i>	Sets the default gateway that serves the DSC.
TFTP_SERVER = <i>ip_address</i>	Sets the IP address of the TFTP server where a bootable software image is located.
TFTP_FILE = <i>drive:path/file</i>	Sets the default gateway that serves the DSC.

Environmental variable	Description
TURBOBOOT = <i>on=on, boot-device, options</i>	Completely replaces the existing software when the router is reloaded.
BOOT = <i>drive:path/file</i>	Sets the directory and filename of a bootable software image.
AUX_AUTHEN_LEVEL = <i>number</i>	Completely replaces the existing software when the router is reloaded.
IOX_ADMIN_CONFIG_FILE = <i>drive:path/file</i>	Identifies the boot software for a node. This variable is usually set automatically when the router boots.
IOX_CONFIG_FILE = <i>drive:path/file</i>	Bypasses ksh authentication. A reboot is required only on the card that has to bypass authentication.
IOX_CONFIG_MEDIUM = <i>drive:path</i>	Permanently changes the default location where configuration files are saved.

Displaying Environment Variable Settings

To display the current environment variable settings, enter the **set** command :

```
rommon 2> set

PS1=rommon ! >
RET_2_RUTC=1142837696
CONFIG_FILE=
NT_K=0:0:0:0
CONFGEN=74
CHASSIS_SN=TBM10080357
IOX_ADMIN_CONFIG_FILE=
IP_SUBNET_MASK=255.255.255.0
DEFAULT_GATEWAY=172.29.52.1
IP_ADDRESS=172.29.52.226
RET_2_RTS=08:45:17 UTC Tue Jul 3 2007
RET_2_RCALTS=1183452318
BOOTLDR=bootflash:c12kprp-boot-mz.120-32.S7.bin
MIRROR_ENABLE=Y
BOOT_DEV_SEQ_CONF=disk0;;disk1:
?=0
TURBOBOOT=
BSI=0
BOOT=disk0:c12k-os-mbi-3.9.0.08I/mbiprp-rp.vm,1;
BOOT_DEV_SEQ_OPER=disk0;;disk1:
ReloadReason=1
```

Entering Environment Variable Settings

Environment variable settings are entered in capital letters, followed by a definition. The following example shows the environmental variables used to configure the control Ethernet port on a Cisco XR 12000 Series Router:

```
rommon 1> IP_ADDRESS=1.1.1.1
rommon 2> IP_SUBNET_MASK=255.255.254.0
rommon 3> DEFAULT_GATEWAY=1.1.0.1
```

Saving Environment Variable Settings

To save the current environment variable settings, enter the **sync** command:

```
rommon 1> sync
```



Note Environmental values that are not saved with the **sync** command are discarded whenever the system is reset or booted.

Clearing Environment Variable Settings

To clear the environment variable settings, enter the **unset** command:

```
rommon 1> unset
To make the change permanent, use the sync command.
```



Note Environmental values that are not saved with the **sync** command are discarded whenever the system is reset or booted.

Exiting ROM Monitor Mode

To exit ROM Monitor mode, you must change the configuration register to 0x102 and reset the RP. This process can be done by either entering CLI commands or responding to prompts.

Resetting to EXEC Mode with CLI Commands

Perform this task to reset the configuration register in ROM Monitor mode and start the RP in EXEC mode.

SUMMARY STEPS

1. **confreg 0x102**
2. **reset**

DETAILED STEPS

	Command or Action	Purpose
Step 1	confreg 0x102 Example: rommon B1> confreg 0x102	Resets the configuration register to enter EXEC mode after the system is reset.
Step 2	reset Example: rommon B1> reset	Resets and initializes the router.

Resetting the Configuration Register Using Prompts

To change the configuration register settings in the ROM Monitor mode, enter the **confreg** command at the ROM Monitor mode. Entering this command displays the configuration summary and the prompts used to change the configuration.

SUMMARY STEPS

1. **confreg**
2. Respond to each prompt as instructed.
3. **reset**

DETAILED STEPS

	Command or Action	Purpose
Step 1	confreg Example: rommon B1> confreg	Starts the configuration register configuration prompts.
Step 2	Respond to each prompt as instructed.	See the example that follows this procedure for more information.

	Command or Action	Purpose
Step 3	reset Example: rommon B2> reset	Resets and initializes the router.

Additional References

The following sections provide references related to the ROM Monitor.

Related Documents

Related Topic	Document Title
Connecting a terminal to a router	<i>Connecting and Communicating with the Router in Cisco IOS XR Getting Started Guide for the Cisco XR 12000 Series Router</i>
Configuring a router with Cisco IOS XR software	Cisco IOS XR Software Documentation: http://www.cisco.com/en/US/products/ps5845/tsd_products_support_series_home.html

Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	http://www.cisco.com/support